Stress strain experiment - lab report example

Engineering

Stress strain experiment

College Strain gauge A strain gauge as the suggests is an electrical device used to measure the strain of an object. Strain is the ratio of increase in length to original length when an object is subjected to some force (stress). It is made of a small diameter wire or an etched metal foil that is attached to a backing material. The wire is coiled severally to create a long wire.

The principle of operation is based on electrical resistivity of the wire. The electrical resistance R of a wire of length L with cross-sectional area A can be illustrated by the formulae;

Where is the strain.

From the above equation we can draw an inference that the electrical resistance of the wire changes with strain:

i. As strain increases, the wire length L increases, which increases R.

ii. As strain increases, the wire cross-sectional area A decreases, which increases R.

For most materials, as strain increases, the wire resistivity also increases. When the stain gauge is subjected to some stress the wire properties do change and hence gives us a measure of strain.

The strain gauge is put into practical application in measuring the stain in bridges, structural beams, and weigh bridges and in motor vehicle industries. Stain gaged is mounted on the structural beams and used to measure the shrinkage on subject to some force.

Relatively it is difficult to measure the real change in resistance of the strain gauge and the change need to be converted into an electrical signal. To obtain a real result, the strain gauge is connected to an electric circuit which

is commonly a Wheatstone bridge to give a real measure of strain electrically. The Wheatstone bridge measures small change in resistance and outputs it as a voltage.

Graph of stress against strain when a wire of area 122. 65625mm2, initial length of 50 mm and diameter is 12. 5 mm

From the graph we can analyse that mild steel is stronger than aluminium metal. On observing the yield strength points, mild steel has it at 350N/mm2 and for aluminium is at 200 N/mm2.

Young’s modulus E is found by calculating the slope of the elastic region of the curve (which is point from origin to the point of yield stress.)

For mild steel; = 1250

For aluminium; E= 2346

Graph of stress against strain when a wire of area 19. 625mm2, initial length of 50 mm and diameter is 5 mm.

In conclusion from the young’s modulus results we can conclude that aluminium is more stiff than mild steel.

References

Yang, B. (2005). Stress, strain, and structural dynamics an interactive handbook of formulas, solutions, and MATLAB toolboxes. Amsterdam: Elsevier Academic Press.